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INTERGOVERNMENTAL NEGOTIATING COMMITTEE
FOR A FRAMEWORK CONVENTION ON CLIMATE CHANGE

EXECUTIVE SUMMARY OF THE NATIONAL COMMUNICATION OF

CANADA

submitted under Articles 4 and 12
of the
United Nations Framework Convention on Climate Change

In accordance with decision 9/2 of the Committee, the interim secretariat is to make available, in the official languages of the United Nations, the executive summaries of the national communications submitted by Annex I Parties.

GE.94-64790

Copies of the Canadian national communication can be obtained from:
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CANADA

1. Canada's National Report on Actions to Meet Commitments under the United Nations Framework Convention on Climate Change provides a snapshot of action currently being taken by Canadian governments, non- governmental organizations, communities and the private sector to meet domestic and international climate change commitments.

2. Under the Framework Convention on Climate Change, countries must adopt measures to mitigate climate change, adapt to its possible effects, increase public awareness and scientific understanding of climate change and possible responses, and work together in all of these areas. As a first step, Canada has established a national goal to stabilize net emissions of greenhouse gases not controlled by the Montreal Protocol at 1990 levels by the year 2000. Canada must submit a report on actions being taken to meet its commitments under the Convention six months after it enters into force, and on a regular basis thereafter.

3. At the 1992 United Nations Conference on Environment and Development, Canada announced a "quick-start" agenda that included a commitment to produce its first national report in 1993. A draft was released in September 1993 by the co-chairs of the National Air Issues Co-ordinating Committee (NAICC) for public review and comment. This review process provided Canadians with an opportunity to comment on a number of reporting and assessment issues and, more generally, on the shape and direction of Canada's response to climate change. Many comments and suggestions regarding the national report have been incorporated.

4. This national report provides governments, non-government stakeholders and individual Canadians with a foundation for understanding Canada's situation and for determining the extent of further action needed to meet Canada's climate change goals.

Canada and Climate Change

5. There is general agreement in the international scientific community that increasing the atmospheric concentration of greenhouse gases will result in global warming. There are, however, uncertainties about the timing and regional magnitude. Clearly, projections of the possible impact of climate change in Canada must be treated with some caution.

6. These projections indicate that climate change could result in significant changes to many of Canada's natural ecosystems. For example, there could be wider variations in temperature, a rapid northward shift of climatic zones, lower water levels in the Great Lakes-St. Lawrence Basin, rising sea levels along Canada's coasts and increased land instability in northern Canada as a result of permafrost decay. The consequences for wildlife,

human communities and the Canadian economy could be significant. Research is continuing in Canada to improve scientific understanding of climate change and its possible impact.

7. Canadian demand for energy — to heat and light homes; operate industries, farms and businesses; and move people and products from place to place — is the chief cause of anthropogenic greenhouse gas emissions. Canada is an energy-intensive country because of unique characteristics such as a low population density, large distances between urban centres, cold climate, relatively affluent lifestyles and a reliance on energy-intensive economic activities.

8. Fossil fuels (coal, oil and natural gas) meet close to three quarters of Canada's total primary energy demand. The remainder is supplied by hydro and nuclear power, and other renewable (mainly biomass) sources. Solar and wind power currently meet only a very small portion of Canada's overall energy needs, primarily for niche applications such as hot-water heating, navigational buoys and irrigation water pumps. Efforts by Canadians to improve energy efficiency also play an important role in Canada's efforts to manage its energy resources.

9. These, and other, national circumstances have shaped Canada's unique national greenhouse gas emissions profile, and provide insight into the challenges and opportunities Canada faces in responding to climate change.

10. Canada's federal, provincial/territorial and municipal governments share responsibility for areas where action can be taken to address climate change. The draft National Action Strategy on Global Warming provides a framework for action by government and non-government stakeholders to limit greenhouse gas emissions, adapt to the possible effects of climate change and improve scientific understanding.

Action Taken by Canada to Address Climate Change

11. As a first step in meeting Canada's stabilization commitment, governments, utilities, private corporations and community organizations are developing and implementing measures to limit greenhouse gas emissions. These measures make economic sense in their own right, or serve multiple policy objectives. Canada has adopted a comprehensive approach that addresses emissions of all greenhouse gases from anthropogenic sources and the sequestering of these gases by sinks. This approach provides Canadians with the flexibility to meet Canada's climate change objectives in a cost-effective manner.

12. Measures already taken in Canada seek to limit emissions or enhance the capacity of sinks using a range of policy instruments, including information and education initiatives, voluntary measures, regulation, research and development, and economic instruments. Action

has been taken in the following sectors: transportation, electricity generation, residential and commercial, resource and manufacturing industries, and waste management.

13. The majority of measures taken in Canada have been aimed at increasing energy efficiency and energy conservation or encouraging a switch to energy sources that are less carbon intensive. There are also measures in place to address non-energy sources of greenhouse gases and to enhance carbon sinks in the forestry and agricultural sectors.

14. While limiting greenhouse gas emissions is fundamental to mitigating climate change, the Framework Convention on Climate Change is based on the principle that an effective response also requires adaptation, education, research and international co-operation. Steps have been taken in Canada to address climate change in all of these areas.

15. Canada is studying actions that may be needed to adapt to possible changes in the world's climate. This work involves examining how Canadians have adapted to Canada's many diverse climatic zones. Also under way are assessments that integrate the projected environmental, social and economic effects of climate change on different economic sectors and regions of Canada

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16. Many Canadian organizations are working to increase public awareness of climate change through education and information campaigns, conferences and contributions to school curricula. These educational activities are based on the premise that Canadians will be more likely to support action to address climate change, and take action voluntarily, if they become "environmental citizens" with a better understanding of the linkages between their actions and the impact on the environment.

17. Canadians from different sectors of society are working together to reduce scientific and socio-economic uncertainties with respect to climate change. Efforts are being made to improve the collection of past and current climatological data in Canada, and Canada continues to improve its ability to study possible future climates with its general circulation model. Canada is also involved in several international studies to improve understanding of the processes through which the various elements (i.e., atmosphere, oceans, land) of the climate system interact, particularly in the northern regions of the planet. Finally, there is research under way on the possible impact of climate change and the socio-economic implications of measures to limit greenhouse gas emissions.

18. At the international level, Canada contributes funding for developing country participation in fora such as the Intergovernmental Panel on Climate Change and the Intergovernmental Negotiating Committee of the Climate Change Convention.

19. The contribution of developing countries to global greenhouse gas emissions is increasing, and Canada is helping these countries meet their own commitments under the Convention by providing financial and technical resources through the Global Environment Facility and bilateral channels. This support assists developing countries in the preparation of

country studies that examine their current situation. It also helps to limit greenhouse gas emissions and facilitate adaptation to climate change.

Assessing Canada's Progress in Mitigating Climate Change

20. Observed or projected changes in emission trends provide only partial insight into how Canada is doing in meeting its climate change objectives. Factors such as energy prices, economic output levels, energy use patterns, land use changes, technological developments and changes in behaviour all influence emission trends.

21. Canada is developing an integrated approach to assess progress towards meeting its emission limitation commitments. This approach seeks to understand how actions to limit emissions interrelate with other factors to change past and future emission trends. Such an understanding is necessary to ensure that actions have a real and sustained impact on emission levels.

22. This report describes four tools used to assess progress in limiting emissions.

Emissions Inventories

23. Annual emissions inventories provide a tool for assessing progress in limiting emission levels and also provide a crucial reference point for other assessment tools (i.e., climate change indicators, emissions outlooks and case studies).

24. In 1990, Canada's total energy-related and non-energy-related emissions of the three major anthropogenic greenhouse gases, carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), were equivalent to 526 megatonnes (Mt) of CO_2 emissions, as calculated on the basis of their global warming potential over a 100-year period. CO_2 accounted for 87% of these emissions, with CH_4 and N_2O accounting for 8% and 5% respectively.

25. Energy production and consumption generated 98% of Canada's anthropogenic CO_2 emissions in 1990. The major sources of emissions were the transportation sector (32%), electricity generation (20%) and industrial sources (16%).

Climate Change Indicators

26. Canada has begun developing climate change indicators to understand the relationship between emission trends and underlying social, economic, technological, and behavioural factors.

27. During the 1960s and 1970s, CO_2 emissions in Canada grew at a rapid pace of 4% a year, fuelled by strong per capita output and population growth. Emissions then

declined, beginning in 1980 as Canadians responded to higher energy prices and large-scale government efficiency and conservation programs. In 1986, CO_2 emissions began rising again as oil prices collapsed and both the public and private sectors reduced emphasis on energy efficiency and conservation programs.

28. After reaching a historical peak of 487 Mt in 1989, energy-related CO_2 emissions fell in 1990 to 461 Mt. The Canadian economy was in recession, above average winter temperatures were experienced in many regions of the country and high water levels allowed hydro-electricity to temporarily displace electricity normally produced from coal-fired generators. As the economy climbs out of the recent recessionary period, emissions are expected to rise once again, unless the relationships between emissions and human production and consumption activities are altered. In fact, CO_2 emissions fell a further 6 Mt in 1991, but preliminary estimates show they were on the rise again in 1992.

Emissions Outlook

29. This national report includes an outlook for future energy-related emissions of the three primary greenhouse gases, CO_2, CH_4 and N_2O, to the year 2000. In aggregate, the energy sector accounts for 88% of these gases. Emissions from non-energy sources — representing 12% of Canada's total emissions — are not included. Also not included in the outlook is the removal of greenhouse gases from the atmosphere through the protection and enhancement of sinks.

30. Based on certain key assumptions and the continuation of existing policies, programs and measures, the outlook shows that energy-related emissions of CO_2, CH_4 and N_2O will be equivalent to about 538 Mt of CO_2 in the year 2000. This means that the emission level in 2000 will be 52 Mt, or close to 11% higher, than the 1990 level.

31. This outlook is one of many plausible views of the future. It is sensitive to underlying macro-economic assumptions, such as energy prices, the structure of the economy and economic growth. Changes to any one of these will lead to very different outcomes. For example, a US$5 decrease in world oil prices would increase the CO_2 emissions "gap" by about 30% in the year 2000. A continuation of historical growth trends in the goods and services sectors would reduce the gap by about 30%. And increasing or decreasing economic output by 1% would enlarge or reduce the size of the gap by roughly 60% in the year 2000. In addition, this outlook incorporates the effects of only those federal and provincial energy and environmental policies, programs and measures currently in place or close to implementation. In other words, no assumptions have been made about future changes in these actions or additional ones that may be undertaken. In some instances, however, assumptions have been made about the extent to which certain initiatives are implemented by various jurisdictions.

32. Emissions outlooks are an important tool for understanding how various factors can drive the anticipated growth in emissions and the progress Canada is making towards

achieving its climate change objectives. They must be used in conjunction with the other assessment tools discussed in this national report when considering the scope and nature of additional measures to limit emissions.

Case Studies

33. The use of case studies to assess the effectiveness of measures to limit greenhouse gas emissions from selected areas of economic activity offers a bottom-up analysis of policy effects that complements top-down assessment tools such as emissions outlooks and climate change indicators.

34. This national report includes one case study to illustrate the value of this assessment tool. It concludes that current and planned measures to limit greenhouse gas emissions associated with space heating requirements in new single-family homes will reduce emissions in this area by 18% from what they would otherwise be in the year 2000.

Summary

35. The initial assessment of Canada's progress towards meeting its climate change objectives indicates that additional measures are needed if Canada is to meet these objectives. In response to this conclusion, federal and provincial/territorial energy and environment ministers, at their joint meeting in November 1993, instructed their officials:

> ...to proceed with the development of options that will meet Canada's current commitment to stabilize greenhouse gas emissions by the year 2000 and to develop sustainable options to achieve further progress in the reduction of emissions by the year 2005.

36. A process has been established to develop and recommend to federal and provincial/territorial energy and environment ministers a national action program designed to meet Canada's climate change goals. This process is based on a new Comprehensive Air Quality Framework that encourages all jurisdictions in Canada to co-ordinate, and co-operate in, the management of all air issues, including acid deposition, smog, ozone depletion and, of course, climate change. This framework is being implemented by means of a National Air Issues Co-ordinating Mechanism.

37. Part of the new co-ordinating mechanism is a national Task Group on Climate Change. This multi-stakeholder group of government, business, labour, consumer and environmental members has accepted responsibility for completing this, and future, national reports, providing advice to the federal government regarding positions Canada should be taking during international climate change negotiations, and developing a national action program to achieve Canada's climate change goals.

38. Achieving the goals set by Canada on climate change is a challenging task, one that requires the efforts and co-operation of all government and non-government stakeholders. It is also a challenge that must be met by individual Canadians in their daily lives if long-term, sustainable progress in addressing climate change is to be made. As part of this effort, Canada will continue developing assessment tools to determine if such progress is being achieved. The integrated approach to assessment is an evolving one that will benefit from future contributions provided by related activities under way domestically and internationally.

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FOR A FRAMEWORK CONVENTION ON CLIMATE CHANGE

EXECUTIVE SUMMARY OF THE NATIONAL COMMUNICATION OF

DENMARK

submitted under Articles 4 and 12
of the
United Nations Framework Convention on Climate Change

In accordance with decision 9/2 of the Committee, the interim secretariat is to make available, in the official languages of the United Nations, the executive summaries of the national communications submitted by Annex I Parties.

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Copies of the Danish national communication can be obtained from:

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Environmental Protection Agency
Strandgade 29
1401 Copenhagen
Denmark
Tel:(45-32)66.01.00

DENMARK

Basic data

1. In 1990 the population of Denmark amounted to 5.2 million inhabitants and with a total area of 43.000 km^2 the population density corresponds to approximately 120 inhabitants/km^2. Only a very slight increase in the population is envisaged.

2. Denmark is situated at about 55° Northern latitude and about 10° Eastern longitude. Due to the continental landmass and the warm Gulf stream, the temperature in Denmark is, especially during the winter, relatively high. The weather can in general terms be described as temperate west coast climate with mild winters and cool summers. The average temperature is 8°C and the ground surface receives yearly between 500 and 900 mm of precipitation.

3. Two thirds or 64%, of the area is cultivated agricultural land, approximately 15% is classified as built-up areas and forests account for 10%. Natural areas like moorland, marshland and lakes make up the remaining 10%. The dominating agricultural crop, grain, covers approximately 15,000 km^2 of the Danish landscape.

4. The service sector, market and Government contribute approximately 70% of the Gross National Product - amounting to US$ 129,000 billion in 1990 or US$ 25,000 per capita. In 1990 the GNP increased by 63% compared with 1970.

5. Primary energy consumption increased rapidly in the 1960s but has essentially been stabilized at a level of 750 PJ from 1972 to 1992 as a result of the saturation effect, the two oil crises and the implementation of rigorous energy political instruments during the last 15 years.

6. Oil was replaced by coal, especially for power production and the oil consumption was reduced significantly due to energy savings and changes in consumption and supply system, e.g. introduction of combined heat and power.

7. In 1990 the distribution on energy sources of the total primary energy consumption of 768 PJ was Coal: 41%, Natural Gas:11%, Oil products: 41% and Renewable: 7%.

8. Energy taxes have been implemented on fossil fuels and electricity, especially in the household sector, and the ensuing energy savings in this sector is a strong indication of the efficiency of high energy prices as an instrument to lower the energy consumption.

9. After a recent energy taxation reform, a rather elaborate system of taxes has been replaced by a combined energy and CO_2-tax, with a level for private households of US$ 16 per tonne of CO_2, or approximately US$ 6 per GJ. Industry and service only pay CO_2 tax at a level which is half of the tax for households. Renewable energy is not taxed.

10. The number of passenger cars has increased by 48% in the period 1970 to 1990, and accordingly the road transport for cars shows a growth rate of 73% from 29.8 billion person-km

to 51.5 billion person-km. The transport of goods shows also a slightly lesser increase of 30% for the period from 8.2 billion transport-km to 10.7 billion transport-km.

11. According to traffic prognoses the authorities envisage an increase by the year 2010 of 40% and 60% for passenger and goods transport respectively compared with 1990.

Emissions and uptake

12. The basis of the calculation of emissions of greenhouse gases from the energy sector is primary energy consumption and emission factors. For the other sectors activity data and estimated national emission factors are used. The tables are produced in accordance with the latest version of the IPCC manual for emission inventories, and the figures are aggregated in categories consistent with the manual.

Carbon Dioxide

13. Since the Second World War the development in the emission of CO_2 is showing a very significant trend. In the period from 1945 to 1960 with a rather slow economic development the emission increased from 12 million tonnes to 26 million tonnes, or approximately 1 million tonnes per year. From 1960 to 1972, a period with full steam on the economy, the emission was growing from 26 million tonnes to 62 million tonnes corresponding to a growth rate of 3 million tonnes per year.

14. After the so called energy crisis in 1973 and up to present the emission of CO_2 has due to an active energy management been levelling around 60 million tonnes despite a constant economic development. In the same period the GNP increased by approximately 60%. The variation from year to year is mainly caused by import/export of electricity from the two other Scandinavian countries.

15. The main sources for CO_2 emissions are power plants and transport, with a share of 50% and 20% respectively.

16. The Danish Parliament has decided that during a period of rotation, e.g. 80 - 100 years, the forest area should be doubled. This decision implies an afforestation rate of about 40 km^2/year, corresponding - at its highest level - to a CO_2 fixation rate of approximately 1 million tonnes C per year or 5% of the yearly CO_2-emission.

17. Since no common international agreement has been reached on the methodology on determination of the CO_2-uptake in afforestation programmes the uptake has not been included in the Danish emission inventory but is listed separately.

Methane

18. The yearly anthropogenic emission of methane amounts to about 406,000 tonnes and has not changed through the last decade. Most important is the agricultural sector - enteric

fermentation and animal waste - with 262,000 tonnes corresponding to 65%. Second are emissions from landfills with 120,000 tonnes (30%).

Nitrous oxide

19. The sources to the anthropogenic emission of nitrous oxide are almost completely dominated by the agricultural sector, which accounts for more than 75% of a yearly emission of 11,000 tonnes. The emission rate depends on a complex array of factors like soil structure, pH, temperature, type of crop, water saturation and nitrogen fertilizer. The models for determining the emission are very simplified and their results are encumbered with great uncertainty.

Other GHG

20. The emission of two of three precursors for ozone - NO_x and NMVOC - is regulated within the Geneva-Convention, and for 1990 the emission was estimated at 293 ktonnes and 165 ktonnes respectively. The emission of the third precursor, CO, amounted to 771 ktonnes in 1990.

21. With the aim of phasing out the use of CFC's as fast as possible - at an even faster rate than prescribed by the Montreal-Protocol - the Danish environmental authorities accept HFC's to be used to replace CFC's in some areas. The areas in question are primarily the production of some types of refrigerators and freezers where the assessment of risks and the regulation by the authorities is excluding the use of other substances. In 1990 the use of HFC's was marginal but it has increased to approximately 300 tonnes in 1993.

Vulnerability

22. With a global reduction of the emission of greenhouse gases the development can be slowed down and possibly a new climate equilibrium can be obtained, but it is hardly probable that climate changes can be totally avoided. Without a global effort the climate may change further, but evaluations beyond a century are at present considered almost worthless.

23. It is possible to foresee a series of impacts of climate changes, but it is difficult to estimate their magnitude; sometimes, it may even be impossible to indicate whether they are an advantage or a drawback.

24. If the human influence on the atmosphere proceeds unchanged it may result in climate changes, for Denmark comprising a temperature rise, which by the end of the next century will be about 3°C as a yearly average. It is envisaged that the increase of summer temperature will be a little smaller than the winter temperature, 1-3°C and 2-5°C respectively. At the same time precipitation may increase by up to 10% and the relative sea level rise between 30 and 50 cm.

25. However, it must be assumed that generally the immediate consequences for Denmark in inter alia the agricultural sector, and the management of forests and coast protection within the next century only will be so modest that they can be managed through planned adjustment supported by an expected technological development.

26. A possible exception is the present natural ecosystem where climate changes may be too rapid for some animal and plant species; this may cause temporary instability and in the long run change the composition of species.

27. Denmark is however - ecologically as well as politically and economically - a small open system. The importance of climate changes and sea level rise for the development in the rest of the world may therefore most likely be decisive. The change of climate and the rise of sea level could lead to global economic and political instability.

National programmes

28. Danish policies regarding limitation of climate relevant gases, are rooted in many years of active national policies on energy and environment.

29. The first national energy plan of 1976 together with further development of the policies during the 1980s resulted in a major restructuring of the energy system in Denmark

30. As a result, the total primary energy consumption has essentially been stabilized, despite substantial growth in all economic sectors. In parallel, the environmental impact from the use of energy has been substantially reduced in the same period, as a direct result of the changes in the energy system, as well as introduction of emission standards, emission quotas and other regulations.

31. In the late 1980s, focus was gradually shifted from considerations of security of supply, minimization of energy service costs, and local environmental effects, to wider environmental considerations, notably the goal of achieving long term sustainable developments, on a national as well as on a global level. In 1988, the Danish Government presented its plan of action on environment and development, as a follow up of the recommendations set out in the report from the World Commission on Environment and Development, the Brundtland Report.

32. In 1990 two action plans, relating to energy and transport, were presented to the Parliament. In these plans, limitations of greenhouse gas emissions, notably carbon dioxide, were introduced as explicit targets.

33. In 1992 the objectives of the Danish waste policy were described in the Danish Government's Action Plan for Waste and Recycling 1993-97. Among the objectives of the plan was minimization of deposition of organic material in landfills and energy saving through recycling. A consequence of the plan will be a reduction of the emission of methane from landfill sites.

34. In the Energy Action Plan, the Government listed a number of new initiatives to be implemented, with the expected result of achieving a reduction in CO_2 emissions of 28% in 2005 compared to 1988 levels, for the whole energy sector excluding transport. The Plan was dealt with in the Parliament and there was broad political backing for it.

35. Strategically speaking, the action plan emphasized efficiency improvements in end use, especially in the use of electricity, and increased efficiency of the energy supply systems, notably increased use of combined heat and power, as the most important areas of intervention.

36. The transport action plan, adopted in May 1990 by the Government, had as targets for the CO_2 emissions of the sector, to achieve a stabilization in 2005, and to achieve a 25% reduction by 2030 compared to 1988.

37. The combined effects of the two action plans were foreseen to be more than a 20% reduction in 2005, compared to the base year of the plans (1988). This target was subsequently approved by the Parliament.

38. Apart from this national CO_2 reduction target Denmark has committed itself to stabilize emissions at the 1990 level in 2000 within the framework of the Climate Convention, as well as to achieve a 5% reduction in 2000 compared to 1990, as a contribution to the overall stabilization by the year 2000 for the countries of the European Union (EU).

39. In 1993, the present Government has undertaken a major follow-up of the two action plans, in order to guarantee the achievement of the above targets.

40. In the recent action plan (Follow up on Energy 2000) a revised base scenario for the development of demand and supply, for the energy sector exclusive of transport, has been set up. This base scenario describes the expected development resulting from all measures which will be implemented as a result of implemented policies in place.

41. The analysis shows that the national CO_2 reduction targets would not be met in the base scenario, but fall short by several million t CO_2 in relation to the reduction target of 20% in year 2005.

42. In order to bridge this gap, the Government has launched a packet of initiatives in its action plan "Follow up on Energy 2000", which was published in November 1993.

43. The initiatives are to be implemented through legislation, administrative decisions or negotiations. The content of the packet is a result of extensive screening of a large number of potential options, based on economic and political considerations, and has been thoroughly politically negotiated, to ascertain the necessary parliamentary majority where this is needed.

44. Further more, it is the intention of the Government to increase the use of "green taxes" (taxes on energy, CO_2, water, waste etc.) in all sectors of the economy.

45. As a logical extension of this, Denmark is actively working for the introduction of a combined energy and CO_2 tax within the EU, as well as Community standards for electrical appliances.

46. With the plan in place, a CO_2-reduction of about 23% compared to 1988 levels can be achieved for the energy sector excluding transport. This corresponds to about 18% of the total

CO_2 from energy and transport. Hence additional measures are needed to reach a 20% reduction.

47. In the year 2000, however, the expected reduction will be sufficient to guarantee the fulfilment of a 5% reduction in relation to 1990.

48. The Danish Government intends to review the results of the current plan as well as future initiatives and developments on the international scene on a periodic basis, next time in 1995. Present plans foresee that this revision should include a renewed analysis of the long term options, to update the analysis of the Energy 2000 Plan.

49. The main aim of sustainable transport policy is to promote an efficient transport system for the benefit of the general public and industry, to ensure that the damaging effects of traffic, e.g. pollution and accidents, can be reduced to a minimum in accordance with specified objectives.

50. The target for CO_2 emissions in the transport sector should be seen in relation to the considerable importance attached to helping to solve local environmental problems, which to some extent entails measures which can actually increase CO_2 emissions, e.g. replacing diesel by petrol.

51. The main objectives in the field of waste and recycling are to reduce the quantity of waste arisings, to minimize the environmental impact of waste disposal, and to make use of the resources contained in waste.

52. Today total waste arisings amount to about 10 million tonnes per annum. The objective is that about 50% of the total amount of wastes generated in the year 2000 should be recycled. The remainder should primarily be incinerated and landfilling should be minimized. One of the expected effects of the Plan is a reduction of methane emissions from landfilling.

53. The aim is to incinerate all combustible wastes which is not to be recycled, and which does not present particular incineration problems. By incinerating the energy content in the waste will be used to replace fossil fuels.

54. In connection with incineration, the energy content of non-recyclable wastes should be used effectively like other biofuels, since most of the waste is CO_2-neutral and therefore causes lower CO_2 emissions than burning of fossil fuels.

R & D and systematic observations

55. Denmark contributes actively to international climate research programmes including the World Climate Programme. A main area is the numerical models of the atmosphere. Efforts are directed towards harmonization of the models for weather and climate calculations in order to achieve a uniform model for all problems with a view to enhancing the exploitation of new results of research.

56. The work on climate models includes the study of selected physical processes on the climate and studying the extra-tropical northern hemisphere climate variability. Another important project is the development of a regional model using a high resolution model nested into the global climate model in order to assess regional climate changes caused by an increased greenhouse effect.

57. Climate observations from several Danish stations back to 1872 are available on electronic media, while sea level data are available back to 1890, and sea temperatures back to 1930. A series of data from lighthouses and ships log books from 1675 to 1715 is also included in the data base.

58. The Danish Meteorological Institute (DMI) has been selected as a focal point for a Nordic climate modelling research effort and is collaborating with 11 other European institutes within the European Climate Support Network (ECSN) to promote more effective collaboration in the field of climate monitoring research and prediction. DMI also contributes to climate monitoring within the WMO-coordinated observation programmes (World Weather Watch and World Climate Data Programme).

59. Danish research institutes are heavily involved in the special area of climate research on palaeo-climate, and Denmark has contributed significantly to the European deep drilling project - GRIP - on the summit of the Greenland Ice Sheet. Analyses of the GRIP ice core reveal that climate in Greenland during the last interglacial period was characterized be a series of several cold periods, which began extremely rapidly and lasted for decades to centuries.

International cooperation

60. As a consequence of the global nature of environmental problems Denmark has over the past years intensified action at international level in order to meet the global challenges.

61. The climate problem is to be seen in the context of a broader global challenge. Growing numbers of people have been using up the Earth's store of natural resources. Curbing these trends will require a coordinated international strategy.

62. The awareness of this global challenge and the transboundary nature of the environmental problems were translated into the Danish Government's action plan for sustainable development of 1988, and as a consequence environmental strategies in several sectors have been developed. Plans and strategies will naturally be adjusted in light of the results of UNCED, particularly the Convention on Climate Change, in order to honour the specific obligations.

63. To follow up on UNCED the Danish Government has decided to establish an international environment and emergency fund, the Danish Cooperation for Environmental and Development (DANCED), with the objective of strengthening efforts towards global environmental problems.

64. The United Nations target of 0.7 per cent of GNP in ODA has been reached for many years and the Danish ODA amounts to 1 per cent of GNP by the end of 1993.

65. Denmark wants the GEF to be the financial mechanism for the Convention on Climate Change on a permanent basis, on the condition that GEF is properly restructured.

66. Denmark would have liked to see a threefold increase of the GEF. A replenishment of US$ 2 billion is not sufficient. Denmark will contribute its fair share of GEF 2, but will in addition to that enter into cofinancing arrangements with the implementing agencies.

67. Denmark has since the beginning of the negotiation process contributed to the INC/FCCC special voluntary fund for the participation of developing countries and has been one of the major donor countries to activities in relation to the Convention on Climate Change.

68. Denmark has likewise supported activities in relation to the IPCC Trust Fund.

69. The new strategy under DANCED extends the possibilities of Danish assistance both in general terms to address the comprehensive approach under the Convention, and more specifically to fund country studies pursuant to Article 12 of the Convention.

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INTERGOVERNMENTAL NEGOTIATING COMMITTEE
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EXECUTIVE SUMMARY OF THE NATIONAL COMMUNICATION OF

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submitted under Articles 4 and 12
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Copies of the Australian national communication can be obtained from:
Department of the Environment
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AUSTRALIA

Introduction

1. Australia, along with over 150 other countries, signed the United Nations Framework Convention on Climate Change (FCCC) at the United Nations Conference on the Environment and Development in June 1992. Australia became the ninth country to ratify the Convention when in December 1992 it lodged its instrument of ratification with the United Nations Secretary-General.

2. This national communication sets out how Australia, as an Annex 1 Party to the convention, is meeting its international obligations. It provides a preliminary overview of the national circumstances that influence Australia's response capacity and also outlines what strategies and measures have been taken to date to address the enhanced greenhouse effect.

Australia's National Context

3. Australia is the lowest, the flattest and, apart from Antarctica, the driest of the world's continents. With a land mass of over 768 million hectares, it is the sixth largest country in the world but with a population density of only two people per square kilometre. Australia's population was 17.5 million at June 1991, an increase of 1.4 per cent over the previous year. Net migration accounted for 43 per cent of this increase. In the period 1985–92, Australia had a population growth rate that was higher than all other Annex 1 countries with the exception of Turkey.

4. Australia has a wide range of climatic zones. Rainfall variability is characteristic of much of the continent. Extreme climate events such as droughts, floods, tropical cyclones, severe storms and bushfires are regular environmental factors requiring flexibility and adaptation.

5. Land use in Australia covers a vast array of activities including agriculture and forestry, nature conservation, mining, human settlement and infrastructure. The present standing biomass of forest vegetation is estimated to contain about 70 gigatonnes of carbon dioxide. Australia's forest resources encompass some 41 million hectares of native forest and 1 million hectares of plantations. In recognition of its unique and megadiverse fauna and flora, Australia has one of the world's largest designated areas for nature conservation with over 50 million hectares of terrestrial parks and reserves and nearly 40 million hectares of marine and estuarine protected areas.

6. While the service sector is increasingly important to the economy (accounting for 70 per cent of GDP in the 1990s), Australia is very reliant on the export of fossil fuels. In 1990-91 the coal industry accounted for 14.5 per cent of total commodity exports. Australia has no domestic nuclear power facilities and strictly regulates the development of new uranium mines and uranium exports. This contrasts markedly with other OECD countries where average consumption of nuclear energy is around 23.8 per cent of energy use.

7. In 1989-90, the energy production sector, excluding coal and uranium production, accounted for 5 per cent of GDP, one per cent of total employment, A$60 billion in capital investment and 8 per cent of total Commonwealth Government revenues. While demand for energy has been growing strongly over the last three decades, and Australia's efficiency in energy production has increased over this period. Total emissions are estimated at less than 1.4 per cent of world emissions although per capita emissions are high because of the export orientation of the economy and size of energy intensive industries such as aluminium smelting.

8. Australia is for historical and geographical reasons reliant upon fossil fuel-dependent road transport because of the dispersed distribution of population centres across the continent and the low density of settlements within major urban areas. Almost 90 per cent of passenger kilometres and 33 per cent of freight kilometres are accounted for by road transport. Overall, the transport sector accounts for some 24 per cent of all emissions of carbon dioxide from fossil fuels.

9. While Australia recognises that accurate scientific data on the potential regional impacts of climate change are not yet available, there are particular vulnerabilities that warrant action in line with the precautionary principle. For example, the potential dangers of the spread of tropical diseases and pests could adversely affect the agricultural and pastoral industries. Coastal areas may be subject to greater storm and flood frequency increasing the cost of infrastructure and services.

Australia's National Greenhouse Gas Inventory (NGGI)

10. Australia has used a methodology based on the IPCC methodology to compile the Australian National Greenhouse Gas Inventory (NGGI).

11. A key issue for Australia is the anthropogenic burning of biomass. This phenomenon has been occurring for at least the last 40 000 years as part of land management practices and is still used throughout Australia. Deliberate regular burning of biomass under controlled conditions causes less damage to vegetation, wildlife and human settlements than catastrophic bushfires. Because controlled

burning does not change the natural carbon cycle, carbon dioxide emissions from that source have not been included in the inventory.

12. Overall, while the inventory is consistent with the current state of world knowledge in greenhouse gas assessments the level of robustness in the figures does vary with the quality of the data obtained. For example, while the transport sector estimates have a high degree of accuracy (plus or minus 10 per cent), the land use and forestry sector and the agriculture sector have a much higher degree of uncertainty (typically a factor of two). This is because of the implicit difficulty in obtaining accurate data and statistics on land clearing and on the carbon content of vegetation and in soils. Research to improve the quality of the data will continue.

13. For 1990 the inventory shows that Australia emitted 572 million tonnes of carbon dioxide equivalent, of which the distribution by gas was:

.	Carbon dioxide	73.4%
.	Methane	22.9%
.	Nitrous oxide	3.1%
.	Other	0.6%

14. Total carbon dioxide emissions for 1990 from all sectors amounted to 420 million tonnes. Carbon dioxide emissions from energy production and use (282 million tonnes) dominate. Emissions from land use change and forestry contributed just over 30 per cent of the total.

15. Within the energy sector, the main source of carbon dioxide emissions is energy transformation industries producing 160 million tonnes of carbon dioxide. Emissions from energy and transformation industries were close to twice those of transport. Industrial processes sector emissions are only 1 per cent of total carbon dioxide emissions. The main source of emissions in the biosphere was land clearing for agriculture which are estimated by the expert group to lie between 39 million tonnes and 352 million tonnes with a best estimate of 156 million tonnes. Managed forests are however a sink and carbon dioxide uptake by managed forests and pasture improvement amounted to 25 million tonnes or 16 per cent of carbon dioxide emissions from land clearing.

16. Methane emissions for 1990 amounted to 6.2 million tonnes. In terms of carbon dioxide equivalents, methane emissions at 131 million tonnes accounted for about 23 per cent of total emissions of 572 million tonnes. The main sources of methane emissions were waste and agriculture, especially livestock.

17. Nitrous oxide emissions of 17.4 million tonnes carbon dioxide equivalent make up 3 per cent of total 1990 greenhouse gas emissions of 572 million tonnes. Agriculture was the primary source of nitrous oxide emissions.

18. The sources of other minor gases are discussed in the body of the report.

National Greenhouse Response Strategy (NGRS)

19. The primary framework for addressing climate change is the National Greenhouse Response Strategy which along with the National Strategy for Ecologically Sustainable Development was endorsed by Australian Governments (Commonwealth, state and local) in 1992. It is important to note that the NGRS is a dynamic strategy that provides for a phased approach to the introduction of measures in order to achieve cost-effective outcomes of lasting, long term benefit.

20. In the first phase of measures adopted under the NGRS, Australian governments agreed to a range of initiatives based on the comprehensive approach of addressing all sources, sectors and sinks of greenhouse gases. The prime objective is set by the Interim Planning Target which aims to:

> stabilise greenhouse gas emissions (not controlled by the Montreal protocol) based on 1988 levels by the year 2000 and to reduce these emissions by 20 per cent by the year 2005...subject to Australia not implementing response measures that would have net adverse impacts nationally or on Australia's trade competitiveness, in the absence of similar action by major greenhouse gas producing countries.

21. The main initiatives aimed at addressing greenhouse gas emissions are:

- structural reform of the electricity sector (including integrated least cost planning)
- energy pricing to better reflect economic, social and environmental costs
- removal of impediments to free and fair trade in natural gas in Australia
- promoting greater use of co-generation and renewable energy options
- improved energy performance in the household, industrial, commercial and transport sectors
- provision of information for energy users.

22. The NGRS recognises that greenhouse friendly policies must be supported by institutional and structural reform particularly in the energy sector. This sector is primarily the responsibility of the states under Australia's federal system of government.

National Electricity Market Reforms

23. The Council of Australian Governments (a domestic heads of government forum for discussing broad, strategic policy issues) agreed to cooperate in the implementation of major structural reform of the electricity supply industry. A National Grid Management Council has been established to oversee the implementation of reforms that include the introduction of competition in the generation sector and the establishment of an independent interstate transmission network separate from generation and distribution interests. The scheduled implementation date for the competitive electricity market is 1 July 1995.

24. The move to a competitive market will allow a range of specific energy benefits to be realised. A competitive market will provide the right price signals which will ensure that efficiency measures, renewable energy options and demand side measures are adopted where they are more cost-effective.

25. For greenhouse gas abatement, this means opening up the opportunities for cleaner energy forms (for example, natural gas and solar power) as well as giving co-generation and demand management options the capacity to compete with traditional coal-based electricity generation. Australia already is a world leader in solar technology while co-generation and demand management are being progressively implemented at enterprise level.

26. For example, a demand management action plan developed by the State Electricity Commission of Victoria resulted in the investment of A$33 million in energy efficiency measures for Victorian businesses. Telecom Australia has used photovoltaic technologies since the 1980s for telecommunications while economic incentives have been used nationally to encourage demand for solar hot water systems. In South Australia, methane from landfill sites is being used to generate power to supplement the state electricity grid.

27. Also, a major point is that the development of a national electricity market is providing incentives for the growth states like Queensland to draw on the excess generating capacity of states such as New South Wales, thereby obviating the necessity for additional electricity generation in the future. In addition, pricing policies that better reflect the full cost of supply and that eliminate cross subsidies should also encourage more sensible investment in energy infrastructure.

Sectoral Initiatives

28. A national program of action on energy management involving the

Commonwealth, states and territories is coordinated by the relevant ministerial council. Energy audits, the use of energy efficient building materials and appliances, guid ines for passive solar housing and strategic designs for more energy efficient urban development are all being actively investigated or implemented at national, state or local government level.

29. In recognition of the importance of the residential and commercial sectors in energy use, the Prime Minister in 1992 announced energy efficiency targets for buildings owned or occupied by the Commonwealth. A 15 per cent increase in efficiency is anticipated within five years and 25 per cent within 10 years. In the manufacturing sector the Commonwealth has encouraged firms at the enterprise level to adopt greater energy efficiency through programs such as Enterprise Energy Audit Program, the Cleaner Production Program and the Better Business by Environmental Management Program. Measures have also been included in the tax system to enable firms to invest in new plant and equipment and offset the costs of environmental expenditures. This provides an incentive for investment in greater energy efficiency. In the transport sector government initiatives with the potential to save energy and reduce carbon dioxide emissions include rail reforms, road transport reform, the promotion of technical innovation, controls on vehicle emissions, a national bicycle strategy, improving the efficiency of public transport and fleets, the use of alternative fuels, urban planning and design and travel demand strategies.

30. Sustainable land use management is becoming the subject of increasing attention in Australia with greenhouse benefits stemming from the enhancement and preservation of the carbon sinks in vegetation and soils. The period 1990–1999 has been declared the decade of Landcare and more than A$320 million has been committed by the Commonwealth for land management, tree planting and remnant vegetation protection programs. Tax concessions have also been provided to enable rural producers to offset environmental management costs. Measures to manage land clearing and forestry have also been introduced as part of the broad range of measures agreed as part of the National Strategy for Ecologically Sustainable Development and the National Forest Policy Statement.

31. Research into the processes of climate change and its monitoring has also been a major task for Australia's premier research institutions. A core research program is conducted by CSIRO in conjunction with the Bureau of Meteorology and leading universities to investigate the fundamental aspects of climate change. A dedicated research program has also been established to increase understanding of the processes and sensitivities of climate change and the implications for adaptation. International, regional and bilateral research cooperation is also undertaken by Australia.

32. A number of preliminary research activities on the economic impact of response measures have also been undertaken.

33. The importance of having all stakeholders involved in the consideration and implementation of greenhouse gas abatement activity is underscored by the Commonwealth Government's establishment of the National Greenhouse Advisory Panel (with membership drawn from key community interest groups), the establishment of non-government organisation forums to keep agencies abreast of current developments (in science and policy) within an open government framework. A specific greenhouse subcommittee of the Intergovernmental Committee for Ecologically Sustainable Development has also been established to consider possible options to strengthen the NGRS.

34. In recognition of the global nature of climate change, international assistance has also been provided to developing countries both on a multilateral and bilateral basis. For example, Australia has contributed A$30 million in the pilot phase for the Global Environmental Facility and further funds are planned for replenishment. Other assistance has been provided through a range of specific program areas relating to climate change.

Projections and impacts of measures

35. On present estimates, if no greenhouse gas measures were taken, Australia's greenhouse gas emissions would grow from 572 million tonnes of carbon dioxide equivalent in 1990 to 654 million tonnes in the year 2000. This would represent an increase of 82 million tonnes or 14 per cent over 1990 levels. This estimate is, however, dependent on the present accuracy and continuing validity of a number of assumptions, such as oil prices, population growth rates, agricultural markets and technological change.

36. If existing measures are continued at the current rate of application, it is estimated that they would result in emission reduction of about 44 million tonnes of carbon dioxide equivalent in the year 2000. Of this, measures aimed at reducing emissions from sources are estimated to contribute 29 million tonnes and measures aimed at sink enhancement are estimated to contribute the remaining 15 million tonnes.

With current measures taken into account, Australia's greenhouse gas emissions in the year 2000 are projected to be 606 million tonnes of carbon dioxide equivalent, which is 38 million tonnes (7 per cent) above 1990 levels.

Future Directions for Australia

37. The Australian Government has always envisaged that the NGRS would be a framework for a phased response. The review of the NGRS by the National Greenhouse Advisory Panel will provide guidance on possible additional measures that might be introduced in the future. Currently the Commonwealth Government, in consultation with stakeholders, is examining the appropriate areas on which to focus future efforts. Energy services, urban and infrastructure development, transport, commerce and industry and sink conservation and enhancement are six areas from which possible measures might be drawn.

38. The Intergovernmental Committee for Ecologically Sustainable Development which includes representation from Commonwealth and state and territory first ministers in partnership with the National Greenhouse Advisory Panel will have a prime role in assessing opportunities for the development of the NGRS. The Commonwealth Officials Working Group will also assist in facilitating the process for considering further measures in 1994. The need for key stakeholders to be actively involved and to contribute to the process is recognised by the Commonwealth Government. At the same time the scope for international cooperation on both a bilateral and a multilateral basis is also a future area for activity.